

**Table I--CO Concentrations (ppm) on Fun Country Marine VIP XT (16' X59') Houseboat
With a 14 KW Low-CO Westerbeke Generator in the Side-Exhaust Configuration
(Generator - On, Test Date - 3/8/2005)**

Sample Location (Sample #)	Houseboat Generator – No load	Houseboat Generator – 1/2 load
Lower Stern Deck Starboard Side (Sample #1)	Mean = 4.8 Std. Dev. = 13.2 Peak = 90 N = 64	Mean = 1.9 Std. Dev. = 0.4 Peak = 3.0 N = 53
Lower Stern Deck Port Side (Sample #2)	Mean = 9.3 Std. Dev. = 11.6 Peak = 67 N = 64	Mean = 4.5 Std. Dev. = 2.5 Peak = 13.0 N = 53
Lower Stern Deck Starboard Side (Sample #3)	Mean = 3.1 Std. Dev. = 0.4 Peak = 4.0 N = 64	Mean = 3.0 Std. Dev. = 0.9 Peak = 6.0 N = 53
Lower Stern Deck Port Side (on stair rail) (Sample #4)	Mean = 1.3 Std. Dev. = 1.0 Peak = 3.0 N = 64	Mean = 1.0 Std. Dev. = 0.9 Peak = 2.0 N = 53
Mid Deck Cabin Kitchen (Sample #5)	Mean = 1.3 Std. Dev. = 0.5 Peak = 2.0 N = 64	Mean = 1.2 Std. Dev. = 0.5 Peak = 2.0 N = 53
Upper Stern Deck Port Side (Sample #6)	Mean = 2.0 Std. Dev. = 1.7 Peak = 10.0 N = 64	Mean = 1.3 Std. Dev. = 0.7 Peak = 3.0 N = 53
Upper Stern Deck Starboard Side (Sample #7)	Mean = 6.4 Std. Dev. = 1.0 Peak = 9.0 N = 64	Mean = 5.4 Std. Dev. = 0.9 Peak = 8.0 N = 53
Upper Stern Deck Starboard Side (Sample #8)	Mean = 1.8 Std. Dev. = 0.4 Peak = 3.0 N = 64	Mean = 1.7 Std. Dev. = 0.6 Peak = 3.0 N = 53
Mid Deck Wet Bar (Sample #9)	Mean = 2.3 Std. Dev. = 0.5 Peak = 3.0 N = 64	Mean = 2.1 Std. Dev. = 0.5 Peak = 4.0 N = 53

N= number of data points

**Table II--CO Concentrations (ppm) on Fun Country Marine VIP XT (16' X 59')
Houseboat with a 14 KW Low-CO Westerbeke Generator in the Top-Exhaust
Configuration (Generator - On, Test Date - 3/8/2005)**

Sample Location (Sample #)	Houseboat Generator – No load	Houseboat Generator – 1/2 load
Lower Stern Deck Starboard Side (Sample #1)	Mean = 2.1 Std. Dev. = 0.6 Peak = 5.0 N = 81	Mean = 2.8 Std. Dev. = 1.4 Peak = 8.0 N = 53
Lower Stern Deck Port Side (Sample #2)	Mean = 6.9 Std. Dev. = 4.8 Peak = 15.0 N = 81	Mean = 6.3 Std. Dev. = 2.6 Peak = 11.0 N = 53
Lower Stern Deck Starboard Side (Sample #3)	Mean = 3.8 Std. Dev. = 1.2 Peak = 7.0 N = 81	Mean = 3.4 Std. Dev. = 0.7 Peak = 5.0 N = 53
Lower Stern Deck Port Side (on stair rail) (Sample #4)	Mean = 2.0 Std. Dev. = 1.6 Peak = 6.0 N = 81	Mean = 1.5 Std. Dev. = 0.7 Peak = 4.0 N = 53
Mid Deck Cabin Kitchen (Sample #5)	Mean = 1.4 Std. Dev. = 0.5 Peak = 2.0 N = 81	Mean = 1.3 Std. Dev. = 0.5 Peak = 2.0 N = 53
Upper Stern Deck Port Side (Sample #6)	Mean = 2.2 Std. Dev. = 1.1 Peak = 5.0 N = 81	Mean = 1.9 Std. Dev. = 1.5 Peak = 8.0 N = 53
Upper Stern Deck Starboard Side (Sample #7)	Mean = 7.6 Std. Dev. = 1.1 Peak = 11.0 N = 81	Mean = 7.8 Std. Dev. = 1.8 Peak = 14.0 N = 53
Upper Stern Deck Starboard Side (Sample #8)	Mean = 2.0 Std. Dev. = 0.7 Peak = 4.0 N = 81	Mean = 2.0 Std. Dev. = 0.8 Peak = 6.0 N = 53
Mid Deck Wet Bar (Sample #9)	Mean = 2.2 Std. Dev. = 0.5 Peak = 3.0 N = 81	Mean = 2.2 Std. Dev. = 0.6 Peak = 5.0 N = 53

N= number of data points

**Table III--CO Concentrations (ppm) on Fun Country Marine VIP XT (16' X 70')
Houseboat with a 20 KW Low-CO Westerbeke Generator Equipped with a Top-
Exhaust (Generator - On, Test Date - 3/9/2005)**

Sample Location (Sample #)	Houseboat Generator – No load	Houseboat Generator – 1/2 load
Lower Stern Deck Starboard Side (Sample #1)	Mean = 2.1 Std. Dev. = 2.0 Peak = 7.0 N = 83	Mean = 0.5 Std. Dev. = 0.5 Peak = 1.0 N = 31
Lower Stern Deck Port Side (Sample #2)	Mean = 0.7 Std. Dev. = 1.0 Peak = 4.0 N = 83	Mean = 0.2 Std. Dev. = 0.4 Peak = 1.0 N = 31
Lower Stern Deck Starboard Side (Sample #3)	Mean = 0.9 Std. Dev. = 1.0 Peak = 4.0 N = 83	Mean = 0.3 Std. Dev. = 0.5 Peak = 1.0 N = 31
Lower Stern Deck Port Side (on stair rail) (Sample #4)	Mean = 1.0 Std. Dev. = 1.2 Peak = 6.0 N = 83	Mean = 0.5 Std. Dev. = 0.5 Peak = 1.0 N = 31
Mid Deck Cabin Kitchen (Sample #5)	Mean = 1.6 Std. Dev. = 1.1 Peak = 5.0 N = 83	Mean = 1.0 Std. Dev. = 0.3 Peak = 2.0 N = 31
Upper Stern Deck Port Side (Sample #6)	Mean = 1.9 Std. Dev. = 1.2 Peak = 6.0 N = 83	Mean = 1.3 Std. Dev. = 0.5 Peak = 1.0 N = 31
Upper Stern Deck Starboard Side (Sample #7)	Mean = 3.7 Std. Dev. = 2.2 Peak = 10.0 N = 83	Mean = 1.9 Std. Dev. = 0.3 Peak = 1.0 N = 31
Upper Stern Deck Starboard Side (Sample #8)	Mean = 0.9 Std. Dev. = 1.4 Peak = 7.0 N = 83	Mean = 0.1 Std. Dev. = 0.3 Peak = 1.0 N = 31
Mid Deck Wet Bar (Sample #9)	Mean = 1.5 Std. Dev. = 1.1 Peak = 6.0 N = 83	Mean = 1.0 Std. Dev. = 0.3 Peak = 2.0 N = 31

N= number of data points

**Table IV--CO Concentrations (ppm) on Fun Country Marine (14' X 59') Houseboat
with a 12.5 KW Westerbeke Generator Retrofitted with a Zenith Electronic Fuel
Injection Kit and a Top-Exhaust (Generator - On, Test Date - 3/9/2005)**

Sample Location (Sample #)	Houseboat Generator – No load	Houseboat Generator – 1/2 load
Lower Stern Deck Starboard Side (Sample #1)	Mean = 1.2 Std. Dev. = 0.9 Peak = 5.0 N = 28	Mean = 1.0 Std. Dev. = 0.4 Peak = 2.0 N = 21
Lower Stern Deck Port Side (Sample #2)	Mean = 13.0 Std. Dev. = 1.4 Peak = 18.0 N = 28	Mean = 8.5 Std. Dev. = 2.7 Peak = 15.0 N = 21
Lower Stern Deck Starboard Side (Sample #3)	Mean = 0.9 Std. Dev. = 0.6 Peak = 3.0 N = 28	Mean = 1.0 Std. Dev. = 0.4 Peak = 2.0 N = 21
Lower Stern Deck Port Side (on stair rail) (Sample #4)	Mean = 0.2 Std. Dev. = 0.5 Peak = 2.0 N = 28	Mean = 1.0 Std. Dev. = 0.4 Peak = 2.0 N = 21
Mid Deck Cabin Kitchen (Sample #5)	Mean = 0.5 Std. Dev. = 0.5 Peak = 1.0 N = 28	Mean = 0.3 Std. Dev. = 0.5 Peak = 1.0 N = 21
Upper Stern Deck Port Side (Sample #6)	Mean = 2.8 Std. Dev. = 1.0 Peak = 6.0 N = 28	Mean = 2.7 Std. Dev. = 1.2 Peak = 6.0 N = 21
Upper Stern Deck Starboard Side (Sample #7)	Mean = 7.9 Std. Dev. = 1.5 Peak = 5.0 N = 28	Mean = 7.0 Std. Dev. = 0.7 Peak = 8.0 N = 21
Upper Stern Deck Starboard Side (Sample #8)	Mean = 3.0 Std. Dev. = 0.7 Peak = 5.0 N = 28	Mean = 2.9 Std. Dev. = 0.6 Peak = 4.0 N = 21
Mid Deck Wet Bar (Sample #9)	Mean = 0.6 Std. Dev. = 0.6 Peak = 2.0 N = 28	Mean = 0.6 Std. Dev. = 0.4 Peak = 2.0 N = 21

N= number of data points

Table V -- CO Grab Sample Results (ppm) Taken Adjacent (Side Exhaust Configuration, ~24" above the exhaust) or within the Exhaust Plumes (Top Exhaust Configuration)

Boat, Condition (Test Date)	Sample Type	Load	Time^a (min)	Sample Result
Fun Country VIP XT (16' X 59') Houseboat Equipped with a 14 KW Low CO Generator in the Side Exhaust Configuration (3/8/2005)	Ferret Instrument	none	0.25	ND
	Draeger tube (2-60 ppm range)	none	0.5	2
	Ferret Instrument	none	0.5	ND
	Draeger tube (10-3000 ppm range)	none	0.5	ND
	Evacuated chamber	none	1	126
	Evacuated chamber	none	8	ND
Fun Country VIP XT (16' X 59') Houseboat Equipped with a 14 KW Low CO Generator in the Side Exhaust Configuration (3/8/2005)	Ferret Instrument	1/2	0.25	ND
	Ferret Instrument	1/2	0.5	ND
	Draeger tube (2-60 ppm range)	1/2	0.5	ND
	Evacuated chamber	1/2	0.5	16
	Draeger tube (2-60 ppm range)	1/2	1	ND
	Evacuated chamber	1/2	1	ND
Fun Country VIP XT (16' X 59') Houseboat Equipped with a 14 KW Low CO Generator in the Top Exhaust Configuration (3/8/2005)	Evacuated chamber	1/2	7	ND
	Ferret Instrument	none	0.5	15600 ^b
	Draeger tube (10-3000 ppm range)	none	0.5	>3000
	Ferret Instrument	none	0.5	1500
	Draeger tube (10-3000 ppm range)	none	0.5	1100
	Evacuated chamber	none	3	6
	Draeger tube (2-60 ppm range)	none	4	ND
	Evacuated chamber	none	4	155
Fun Country VIP XT (16' X 59') Houseboat Equipped with a 14 KW Low CO Generator in the Top Exhaust Configuration (3/8/2005)	Evacuated chamber	none	5	8
	Draeger tube (10-3000 ppm range)	none	6	ND
	Ferret Instrument	1/2	0.5	ND
	Draeger tube (2-60 ppm range)	1/2	0.5	30
	Draeger tube (2-60 ppm range)	1/2	0.5	20
	Evacuated chamber	1/2	2	ND
Fun Country VIP XT (16' X 59') Houseboat Equipped with a 14 KW Low CO Generator in the Top Exhaust Configuration (3/8/2005)	Evacuated chamber	1/2	5	4
	Evacuated chamber	1/2	6	ND

ND = non detected; ^a Time after the start of the condition; ^b Average of five readings

Table V (continued) -- CO Grab Sample Results (ppm) Taken Adjacent (Side Exhaust Configuration, ~24" above the exhaust) or within the Exhaust Plumes (Top Exhaust Configuration).

Boat, Condition (Test Date)	Sample Type	Load	Time^a (min)	Sample Result
Fun Country VIP XT (16' X 70') Houseboat Equipped with a 20 KW Low CO Generator in the Top Exhaust Configuration (3/9/2005)	Ferret Instrument	none	0.5	48000 ^b
	Draeger tube (3000-70000 ppm)	none	0.5	58000
	Ferret Instrument	none	1	103000 ^b
	Evacuated chamber	none	1	116000
	Draeger tube (10-3000 ppm range)	none	3	200
	Evacuated chamber	none	6	ND
	Draeger tube (10-3000 ppm range)	none	11	100
Fun Country VIP XT (16' X 70') Houseboat Equipped with a 20 KW Low CO Generator in the Top Exhaust Configuration (3/9/2005)	Ferret Instrument	1/2	0.5	1700 ^b
	Ferret Instrument	1/2	1	200 ^b
	Draeger tube (10-3000 ppm range)	1/2	1	200
	Evacuated chamber	1/2	2	230
	Draeger tube (10-3000 ppm range)	1/2	21	240
Fun Country (14' X 59') Houseboat Equipped with a 12.5 KW Generator Configured with a Zenith EFI and Top Exhaust Configuration (3/9/2005)	Ferret Instrument	none	0.5	30000 ^b
	Draeger tube (3000-70000 ppm)	none	0.5	60000
	Evacuated chamber	none	0.5	117000
	Evacuated chamber	none	2	37000
	Draeger tube (3000-70000 ppm)	none	3	20000
	Evacuated chamber	none	4	466
	Draeger tube (10-3000 ppm range)	none	10	900
Fun Country (14' X 59') Houseboat Equipped with a 12.5 KW Generator Configured with a Zenith EFI and Top Exhaust Configuration (3/9/2005)	Ferret Instrument	1/2	0.5	19400
	Draeger tube (3000-70000 ppm)	1/2	2	3000
	Draeger tube (10-3000 ppm range)	1/2	3	700
	Evacuated chamber	1/2	9	595
	Draeger tube (10-3000 ppm range)	1/2	12	600

ND = non detected; ^a Time after the start of the condition; ^b average of five readings

Table VI -- Boat Heading and Weather Data.

Day	Houseboat Bearing	Temp (°C)/ RH (%)	Average Wind direction	Average Wind Speed	Std. Dev. Wind Speed
3/8/2005, morning	300°	17.2/ 59	119°	0.6 m/sec	0.4 m/sec
3/8/2005, afternoon	300°	26.1/ 28	130°	1.4 m/sec	0.3 m/sec
3/9/2005, morning	300°	18.9/ 45	116°	1.8 m/sec	0.7 m/sec
3/9/2005, afternoon	300°	25.6/ 30	133°	1.2 m/sec	0.5 m/sec

Figure 1. Westerbeke Low CO Generator (top) and Catalytic Air Pollution Control Device (bottom).



Figure 2. Sample locations on the Fun Country Marine Houseboats (Note: Fun Country VIP XT (16' X 59') schematics were used in this figure although all of the houseboats tested had similar layouts).

